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FOSSIL TURTLES FROM THE EARLY PLIOCENE BLUFF DOWNS LOCAL FAUNA, WITH A DESCRIPTION OF A NEW SPECIES OF *ELSEYA*

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Summary

Thomson, S. A. & Mackness, B. S. (1999) Fossil turtles from the Early Pliocene Bluff Downs Local Fauna, with a description of a new species of *Elseya*. *Trans. R. Soc. S. Aust.* **123**(3), 101–105, 30 November, 1999.

The freshwater turtle fauna of the early Pliocene Bluff Downs Local Fauna consists of members of the *Emydura*, *Chelodina* and *Elseya* genera. A new species of the chelid genus *Elseya* is described based on a partially articulated carapace and associated plastron. The new species is most similar to the living *Elseya irwini* Cann, 1998 but can be distinguished from it by the close encroachment of the ilium suture to the seventh pleural. It also differs from *E. irwini* in having a very narrow ilium suture, almost approaching the *Emydura* condition in this character. Two additional fossil chelids are described.

Key Words: Pliocene, Bluff Downs Local Fauna, chelids, *Emydura*, *Chelodina*, *Elseya*, turtles.

Introduction

Australian chelid turtle taxonomy is poorly known and much in need of review (Cogger *et al.* 1983; Thomson *et al.* 1997). Electrophoretic surveys have revealed that in some instances, currently accepted species boundaries are difficult to justify and what are currently regarded as single species are in fact two or more species (Georges & Adams 1992, 1996).

The detailed morphological analysis required to verify these findings has not been completed (Thomson & Georges, 1996; Thomson *et al.* 1997), and until recently it was not possible to distinguish even between extant short-necked genera on the basis of osteological characters (Gaffney 1977). The poor knowledge of osteological characters suitable for distinguishing the genera of extant forms makes the identification of fossils, many incomplete, difficult (Thomson *et al.* 1997). In many instances, chelid fossils have been assigned to either *Chelodina* or *Emydura*, with little or no evidence presented to eliminate the possibility that the short-necked forms among them may be *Elseya*, *Rheodytes* or *Elusor*.

Materials and Methods

Specimens of the chelid turtle species identified using electrophoresis by Georges & Adams (1996) were obtained from museums, the Conservation Commission of the Northern Territory and the University of Canberra. Where possible, the voucher specimens of Georges & Adams (1992, 1996) were utilized to avoid incorrect identification. The specimen collection was supplemented by limited field sampling. All specimens were skeletonised and assessed by methods outlined in Thomson *et al.* (1997).

The fossil specimens from Bluff Downs were collected as part of an on-going study of the palaeoecology of the Bluff Downs Local Fauna by one of the authors (BM). Specimens will be deposited in the Queensland Museum. Each was examined to determine the presence of character states for the characters identified as being diagnostic at the level of genus for extant taxa. The fossil specimens were then assigned to genus. Throughout this paper, names of the bony elements of the shell and the overlying scutes follow those of Zangerl (1969) except that we follow Pritchard & Trebbau (1984) and recognize the term pleural as referring to the bones of the carapace rather than the scutes. Additional terminology referring to the anterior bridge struts of the plastron and the bridge strut suture of the carapace follows Thomson *et al.* (1997).

Five characters were identified as diagnostic at generic level. Where polarity is indicated, it was determined by comparison with South American chelids and African pelomedusids in a cladistic analysis to be presented elsewhere (Thomson & Georges unpub.). Only those characters relevant to the identification of the fossil specimen are presented.

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Anterior bridge struts

CHARACTER A. CONTACT WITH PLEURAL 1

A0: In the primitive state, the posterior edge of the bridge-carapace suture runs parallel and adjacent to the rib/gomphosis of pleural 1.

A1: In the derived state, the posterior edge of this suture contacts the rib/gomphosis at its anterior end but is set at a forward divergent angle of between 15° and 50°. This angle is most pronounced in *Emydura*, least in *Rheodytes*.

CHARACTER B. BRIDGE SUTURE SHAPE

B1: The anterior and posterior edges of the bridge-carapace suture diverge from their point of congruence closest to the vertebral column. The widest extent of the suture is distal to the vertebral column and there is no medial constriction.

B2: The anterior and posterior edges of the bridge-carapace suture are parallel or closely so with a prominent suture surface between them. There is no medial constriction.

B3: The bridge-carapace suture is expanded for its full length but more so at extremes, there being an obvious medial constriction.

B4: The bridge-carapace suture narrows from its widest point proximal to the vertebral column and constricts completely to form a ridge confluent with the edge formed by the ventral suture of the peripheral bones.

Rib/gomphosis of pleural 1

CHARACTER C. ROTATION OF THE RIB/GOMPHOSIS

C0: The ventral surface of the distal extent of the rib/gomphosis is rotated obliquely, to face ventrally but with posterior inflection.

C1: The rib/gomphosis shows no such torsion distally.

Dorsal characters

CHARACTER D. RELATIVE WIDTH OF VERTEBRAL 1

D1: First three vertebral scutes equal or sub-equal in width.

D2: First vertebral scute wider than second and third.

CHARACTER E. CERVICAL SCUTE

E0: Cervical scute typically present.

E1: Cervical scute typically absent.

Posterior internal carapace characters

CHARACTER F. CARAPACE PELVIS SUTURE

F0: Ilium sutures to the seventh and eighth pleurals and the pygal.

F1: Ilium sutures to the eighth pleural and pygal only but is directly adjacent to the suture between the seventh and eighth pleurals.

F2: Ilium sutures to the eighth pleural and pygal only but is widely separated from the suture between the seventh and eighth pleural.

Comparative material

All names used for undescribed species are from Georges & Adams (1992, 1996) with modifications from Thomson *et al.* (1997). Abbreviations used: AM, Australian Museum; NTM, Museum and Art Galleries of the Northern Territory; QM, Queensland Museum; WAM, Western Australian Museum; UC, University of Canberra; UM, University of Michigan Field Series; UU, University of Utah.

Elusor macrurus: UC 0184-93, 0225-29 UU 19488, 19508; *Elseya dentata*: NTM 13319, 13521, 16330, QM 59265, 59277-80, UC 0307-18; *Elseya georgesi*: AM 138387-88, UM 02016-17; *Elseya irwini*: ANWC 0520; *Elseya lavarackorum*: QM F24121, QMJ 31939, 31942, 31944, 31946-47, 31949-50, 31952, 46284, 47908, 47911, 48544, 48547, 60255, UC0201; *Elseya latisternum*: AM 123037, 123039, 125474-75, QM 48054-55; *Elseya novaeguineae*: AM 42662, 125038; *Elseya parvisi*: AM 123040, 123042, QM 59289-90; *Emydura macquarii*: QM 48016, 48034, 48050-51, 59275-76, UC 0175-76, 0303; *Emydura subglobosa*: NTM 5028, 8206, 13428, 13433, 16332, UC 0171-72, 0177; *Emydura tanybaraga*: AM 125470-71, 125491, NTM 8211, 8213, 17339, *Emydura victoriae*: NTM 13513-14, 32917, 32976, UC 0165; *Elseya* sp. aff. *E. dentata* (South Alligator): AM 128002, 128004, QM 59285-89, NTM 5097, 13512, 13985, UC 0304; *Elseya* sp. aff. *E. latisternum* (Gwyder): *Elseya* sp. aff. *E. lavarackorum* (Burnett) UC 0305-6, QM 2966, 28449, 36036, 36039, 36041-42, 36044-47, 37933, 38533, 59269-71; *Elseya* sp. aff. *E. lavarackorum* (Johnstone): QM 22694, 23175, 23299, 23300, 23322, 24938, 28449, 48060, 48068, AM 123028-29, QM 48028, 48038; *Pseudemydura umbrina*: UC 0178 WAM 29337; *Rheodytes leukops*: UC 0173.

Systematics

Order Testudines Linnaeus, 1758
Suborder Pleurodira Cope, 1864
Family Chelidae Ogilby, 1905

Elseya nadibajagu sp. nov.
(FIG. 1)

Holotype: QM F30576, a partially articulated carapace and associated plastron collected by H. Godthelp during the 1992 Field Season, Upper Andrews Quarry.

Referred specimens: QM F30577 also collected at the same site.

Type Locality

Upper Andrews Quarry (19° 43' S, 145° 36' E), Allingham Formation, Bluff Downs, Bluff Downs

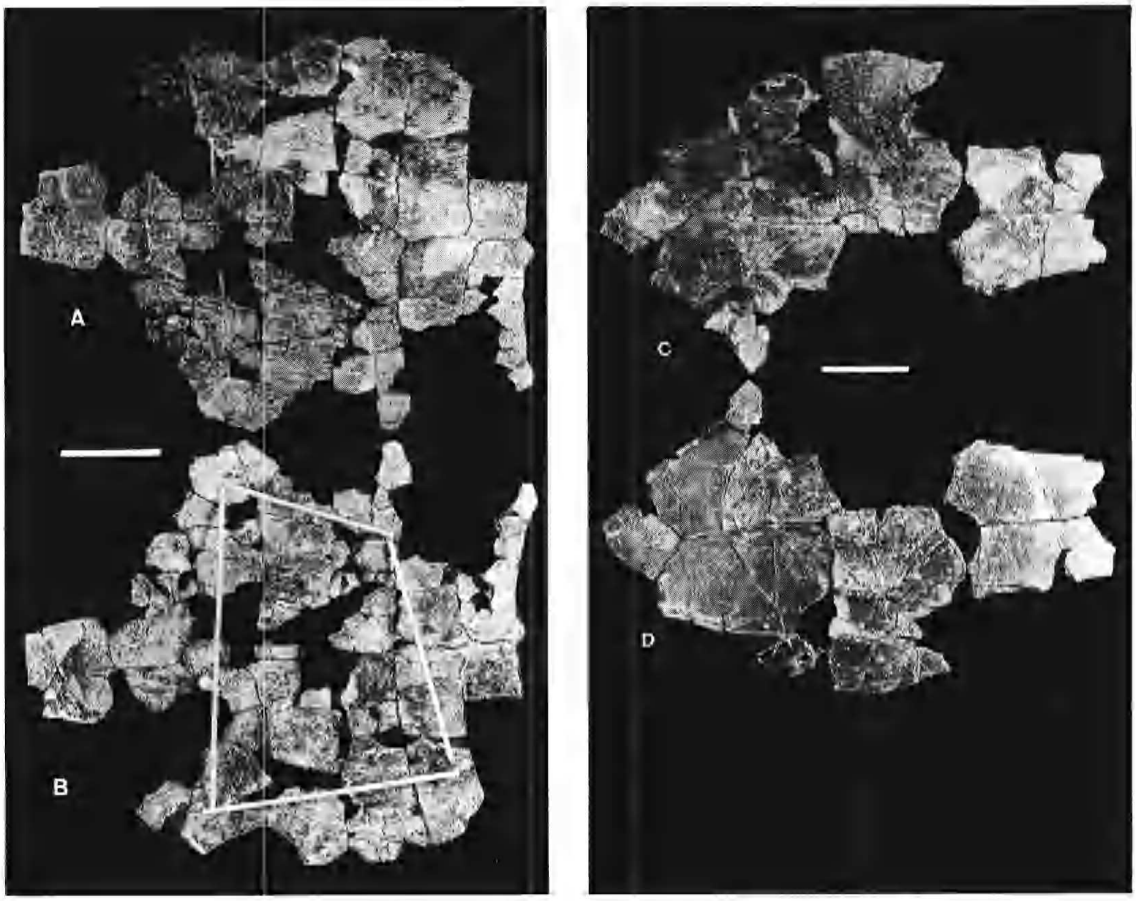

Fig. 1. Holotype of *Elseya nadibajagu* sp. nov. (A). External view of carapace. (B). Internal view of carapace. (C). Internal view of plastron. (D). External view of plastron. Scale bars = 5 cm.

Station, north-eastern Queensland. The Allingham Formation was named by Archer & Wade (1976) for a sequence of terrigenous clays, silts, sands and calcareous sands that outcrop on Bluff Downs Station, along the banks of the Allingham Creek, a tributary of the Burdekin River. Several different quarries have been established to exploit these outcrops, all showing a similar and contiguous stratigraphy (BM unpub.). The sediments recovered are fluviatile and lacustrine in nature and represent a number of depositional events.

Age

Early Pliocene, based on the radiometrically dated age of the overlying basalts (Archer & Wade 1976; Mackness *et al.* in press)

Diagnosis

The fossil is identified as an *Elseya* by the presence of steeply angled bridge struts, features diagnostic of *Elseya* sensu stricto. (Thomson *et al.* 1997; Thomson in press) and *Emydura*. The carapacial sutures for these struts are wide throughout their length, which is diagnostic of the *Elseya lavarackorum* group within this genus (Thomson *et al.* 1997). Other diagnostic features include the first vertebral scute being wider than the second and third and the absence of a cervical scute (Thomson *et al.* 1997; Thomson in press).

Within *Elseya*, this species is most similar to *E. irwini* (Cann, 1998) from the Burdekin River but can be distinguished from it by the close encroachment of the ilium suture to the seventh pleural. In *E. irwini* the suture is widely spaced as is typical of *Elseya* but in *E. nadibajagu* they are extremely close, almost approaching the *Emydura* condition in this character.

Description

Carapace consists of a complete nuchal bone with no cervical scute present. The left pleural one is more complete than the right and the anterior bridge strut has a wide sutural surface between parallel anterior

and posterior edges of the suture throughout its length, which is preserved. The suture is deeply inserted into the carapace and angled sharply away from the rib/gomphosis. The sulci preserved in this region indicate that the first vertebral scute was wider than the second and third.

Pleurals two to six are partially preserved on either side but without their peripheral contacts. Also preserved as an unarticulated unit is the left eighth peripheral. The anterior sutural surface for the ilium is clearly constrained to this unit and does not extend on to, or make sutural contact with, the seventh pleural. It does however, continue on to the pygal in the posterior, the typical condition of the Chelidae.

All the units are represented in the plastron except the epiplastra, which are either both missing or not identifiable among the fragments. Included here also are both bridge struts. The bridge struts are wide throughout the length at the sutural surface where they contact the carapace. The plastral elements, both in sulci and bony elements, are similar in form to any extant member of the *Elseya lavarackorum* group.

Etymology

The specific epithet is from the Gugu-Yalanji dialect phrase *nadi bajagu*, meaning 'very long time ago' (Oates *et al.* 1964) and is used to denote the significant age of the fossil. The name is of neuter gender.

Chelodina sp.

Material examined: QM F30578, an isolated nuchal bone from a long-necked turtle of the *Chelodina longicollis* group.

Remarks

This specimen can be diagnosed by the extreme widening of the posterior half of the nuchal bone as well as the wide, square cervical scute. There is also a large series of muscle attachments for the muscles at the base of the neck which, by necessity, are enlarged in the long-necked turtles (Thomson & Georges 1996). The placement within the *C. longicollis* group is based on the sculptured surface of the shell, a feature more prevalent in species such as *C. longicollis* and *C. novaeguineae* than in members of the *C. expansa* group. This is, however, a highly variable character and probably of poor taxonomic value (Gaffney 1981; Thomson in press).

Emydura macquarii

Material examined: QM F 30579, a series of pleurals all diagnostic of the genus *Emydura* using the bridge strut characters of Thomson *et al.* (1997).

Remarks

None of the pleurals is distinguishable from those of extant species in the area, *Emydura macquarii* (= *E. krefftii*, Georges & Adams 1996) and we therefore take the most parsimonious view and assign the fossil to the living species which is found in Allingham Creek today.

Discussion

The living species that most closely resembles *Elseya nadibajagu* sp. nov. is *E. irwini* described by Cann (1998) on the basis of its head colour. Georges & Adams (1996) have confirmed the validity of *E. irwini* on the basis of electrophoretic studies. Both of these taxonomic indicators (head colour and biochemistry) have not been preserved in the fossil material. The use of osteological characters, such as the position of the ilium/carapace suture, has enabled the separation of *E. nadibajagu* from other members of the genus *Elseya*. There is a possibility, however, that this character may be subject to a lot more variation than can be seen in the limited sample of both *E. irwini* and *E. nadibajagu*, although analyses of variation present in other members of the genus makes this unlikely. Reptiles have a lower rate of species turnover than their mammalian counterparts with many extant species having fossil records stretching back millions of years (La Duke 1991).

White & Archer (1994) described the fossil chelid *Emydura lavaracorum* from the Pleistocene deposits of Riversleigh and living examples were described just three years later (Thomson *et al.* 1977).

The occurrence of three different chelid taxa from Bluff Downs is not unusual with tropical river systems having four or more different genera in the one region (Legler & Georges 1993). There have been five different turtles recorded for the Burdekin (Cann 1998) including three short-necked and two long-necked taxa.

The palaeoenvironment of the Bluff Downs local fauna has been interpreted as being similar to that in present day Kakadu (Boles & Mackness 1994) with avian species such as darters and pygmy-geese indicating permanent water bodies (Mackness 1995). There may have also been riparian rainforest or vine thickets (Mackness unpub.). Fossils of short-necked chelids dominate the Bluff Downs fauna at the time of preservation, indicating a Pliocene palaeoenvironment with well developed rivers, creeks and lagoons and abundant aquatic fauna (Cann 1978; Legler 1985). The long-necked tortoises indicate that at the same time, there may have been shallow turbid lagoons (White 1997).

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